

Claims

1. A process for producing (4S)-4-hydroxy-2,6,6-trimethyl-2-cyclohexene-1-one (phoren-  
ol) from 2,6,6-trimethyl-2-cyclohexene-1,4-dione (ketoisophorone) comprising  
contacting ketoisophorone with a microorganism which is capable of producing actinol  
5 from levodione or with a cell-free extract thereof, with a recombinant microorganism  
which is capable of producing actinol from levodione or with a cell-free extract thereof, or  
with levodione reductase, and isolating the resulting phorenol from the reaction mixture.
2. A process for producing phorenol from ketoisophorone comprising contacting keto-  
isophorone with a microorganism which is capable of producing actinol from levodione,  
10 or with a cell-free extract thereof, and isolating the resulting phorenol from the reaction  
mixture.
3. A process for producing phorenol from ketoisophorone comprising contacting keto-  
isophorone with a microorganism or cell-free extract thereof selected from members of the  
genera *Cellulomonas*, *Corynebacterium*, *Planococcus* and *Arthrobacter*, which are capable of  
15 selective asymmetric reduction of levodione to actinol, and isolating the resulting phorenol  
from the reaction mixture.
4. The process according to claim 3, wherein the microorganism is selected from the group  
consisting of *Cellulomonas* sp. AKU672 (FERM BP-6449), *Corynebacterium aquaticum*  
AKU610 (FERM BP-6447), *Corynebacterium aquaticum* AKU611 (FERM BP-6448),  
20 *Planococcus okeanoikoites* AKU152 (IFO 15880) and *Arthrobacter sulfureus* AKU635 (IFO  
12678), and mutants thereof.
5. The process according to claim 3, wherein the microorganism is *Corynebacterium*  
*aquaticum* AKU611 (FERM BP-6448).
6. A process for producing phorenol from ketoisophorone by contacting ketoisophorone  
25 with a recombinant microorganism or cell-free extract thereof which is expressing the  
levodione reductase gene, and isolating the resulting phorenol from the reaction mixture.
7. The process according to claim 6, wherein the levodione reductase gene is derived from  
a microorganism belonging to the genus *Corynebacterium*.
8. The process according to claim 7, wherein the levodione reductase gene is derived from  
30 *Corynebacterium aquaticum* AKU611 (FERM BP-6448) or a functional equivalent,  
subculture, mutant or variant thereof.

9. A process for producing phorenol from ketoisophorone by contacting ketoisophorone with levodione reductase which is capable of catalyzing the conversion of ketoisophorone regio- and stereoselectively to phorenol.
10. The process according to claim 9, wherein the levodione reductase is derived from a  
5 microorganism belonging to the genus *Corynebacterium*.
11. The process according to claim 10, wherein the levodione reductase is derived from *Corynebacterium aquaticum* AKU611 (FERM BP-6448) or a mutant thereof.
12. The process according to claims 1 to 11, wherein the reaction is carried out at pH  
10 values of from 4.0 to 9.0, at a temperature range from 10 to 50°C and for 15 minutes to 72 hours.
13. The process according to claim 12, wherein the reaction is carried out at pH values of from 5.0 to 8.0, at a temperature range at from 20 to 40°C and for 30 minutes to 48 hours.